August 17, 2012

Via Electronic Filing

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

In Reference To: **Re: Consumer Information and Disclosure Public Notice CG Docket No. 09-158, CC Docket No. 98-170, WC Docket No. 04-36**

Dear Ms. Dortch:

Attached is my submission with regard to the above described matter.

Thank you for giving me the opportunity to submit this material.

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Statement for the Record of

Karl Auerbach

Chief Technical Officer, InterWorking Labs, Inc.

Norbert Wiener Award (2002, Computer Professionals for Social Responsibility)
Former North American Elected Director to the Board of Directors of ICANN
Yuen Fellow of Law and Technology (Caltech and Loyola Law School)

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Who Am I?

I am Karl Auerbach.

I have been associated with the technical development of the internet ever since its inception in the early 1970's.

For much of the last three decades I have designed and worked with tools to measure network conditions, to manage networks, to diagnose and correct internet failures, and to transform the internet into something that could provide lifeline grade service.

I have been a principle or early member of several internet related start-ups, at least three of which were (or are) directly involved in the technical issues here.

I continue today to create new internet products through my current company, InterWorking Labs (http://iwl.com/)

At IWL I work daily with internet measurements and with the re-creation of internet conditions for the purpose of testing how internet protocol implementations react to those conditions.

I am also an attorney (since 1978) and am an active member of the California Bar and its intellectual property section.

Comments

I have no particular interest in who measures internet behavior.

Nor do I find persuasive those arguments that suggest that measures made by commercial interests or using non-open source software are necessarily deficient or necessarily flawed and thus unacceptable. Rather it is my belief that proprietary tools and measures are acceptable, but that there is a burden on those who produce those tools and data to demonstrate their applicability and accuracy. Indeed whether open source or not, those who produce tools and data ought to demonstrate applicability and accuracy.

Our collective goal should be to establish policies so that the internet can be efficient, reliable, and repairable; so that users of the internet (or their designated agents, such as their ISPs) can make meaningful choices; and so that the internet can become the near-lifeline grade utility that many users believe (incorrectly) it is.

The quality, accuracy, and validity of internet measurements are more important than who takes those measures or how.

Some might consider that my comments here may not be strictly germane to the questions raised by the Commission. If that is the case then I urge the Commission to consider a more synoptic inquiry in which questions are raised that go beyond merely who measures what and how.

There is no doubt that internet measurements are important and useful. And there is no doubt that sometimes access to those measurements may give commercial advantage to those who have access while denying that advantage to those who do not.

And there is no doubt that measurements are useful so that consumers of internet services can make informed choices and thus allow consumer-driven market forces to influence the shape of the internet. It is not to be expected that each consumer will understand the technical nature of these measurements any more than we assume that any person buying a publicly traded security would understand a detailed prospectus; we should anticipate that intermediaries will arise who will help consumers understand the technical data.

It should be our policy to allow data to be used, analyzed, and stored by anyone who wishes to do so.

There are strong forces that might drive someone to manipulate data or to deploy tools that give intentionally misleading data.

it should be our policy to enable the auditing and testing of data so that manipulation or error can be detected.

Measurement Context

Measurements are just numbers, and numbers without context are weaker and less useful than numbers with context.

Most of the measures currently being taken are measures between two end-points on the internet. But those measures lack the context of the path being used between those end points. On today's internet those paths may vary by type of traffic, time of day, content of that traffic, presence of competing traffic, quotas, and payments. In other words, simple measures of values between end-points are, without path context, just simple measurements that may or may not have value to predict what the experience of the next user would be.

Today's measurements could be greatly enhanced if additional context were gathered. This is not easy; it is hard to do without getting inside the switches and routers that form the paths between hither and yon. I addressed some of these issues in an unfinished work, the Fast Path Characterization Protocol – http://www.cavebear.com/fpcp/fpcp-sept-19-2000.html

We Ought To Measure More Than Just TCP

Today's measurements tend to focus on that part of the internet that we call the World Wide Web and leave other parts, such as Voice over IP, relatively unmeasured. The TCP protocol is only a part of the internet infrastructure.

Moreover, the thing most often measured, connection speed, is but one network characteristic among many and for some things is almost entirely irrelevant to the performance that a user will perceive.

Voice, domain name traffic, time synchronization, and many other protocols are carried over UDP, the connection-less peer to the connection-oriented TCP transport protocol.

For these UDP based protocols, particularly VoIP and other forms of interactive voice or video, network characteristics that have relatively little impact on TCP can make the difference between usable or useless. For some UDP based protocols, particularly, domain name (DNS) traffic, the effect of certain variables, most particularly packet transit latency, often is amplified many fold and can make even the most responsive of TCP based services feel sluggish or worse.

Unfortunately the state of the art of network measurement is not very well advanced; network instrumentation and management has been a developmental backwater for decades.

We do have some instrumentation of internet devices – such as SNMP MIBs (Management Information Bases) or instrumentation of protocol stacks in servers (Web100). But these tend to be gathered only from end-points and not the intermediate points along the path between user and service. Access is often slow, inefficient, or blocked as a security measure. And even if gathered we often have only a shadowy comprehension of how these numbers interplay with one another in the very dynamic world of internet packet transport.

Moreover. as seen from a client or server end-point it is very difficult to know why a given packet travels the paths hither and yon that it actually does. Routing choices made by providers are considered highly proprietary trade secrets. And the effects of choices made on the basis of deep packet inspection are often entirely opaque.

All of this is to say that we are at the beginning of the road of measuring the internet. We have a lot of research and development to do. And it will take years to deploy these things.

But that is not a reason to delay the FCC's efforts; it is merely a recognition that those efforts should be expected to be merely steps along the way; that our policies and tools ought to be periodically reviewed and revised.

It should be the policy of the FCC to encourage measurement practices that, taken as a whole, give a synoptic view of the internet, not merely of one piece of the internet.

Measurements Are Not Enough

What we have today, useful as it may be, is a pale shadow of what we really need.

The internet is not well engineered to obtain that data.

The current regime does not assure or quantify accuracy of data. Even definitions of individual data points can be weak; for example in the world of SNMP MIBs there have been errors caused when some implementations count Ethernet framing bits and other implementations do not. Under some conditions, this can represent a measurement error of several percentage points.

Nor is the internet well engineered to utilize that data even if it were obtained and of known accuracy.

Even as the classic circuit switched PSTN fades and is being replaced by the internet, in terms of diagnostics and repair today's internet is a lost child compared

to what we had during the heyday of the PSTN.

I encourage the FCC to adopt policies and back initiatives that might induce the internet to become more measurable, more manageable, and easier to diagnose and repair.

Open Source – Why?

Jumping away from technology: I note that there is a tendency to elevate, even to require "open source" tools and restriction-free use of data. Why?

A scale of weights is not made any less accurate if its mechanism is patented or its design documents protected by copyrights.

What policy goal is fulfilled by such requirements?

Let me suggest the following:

It should be United States policy to encourage an internet that is more efficient, more fair, and more reliable. Policies should encourage the publication of data and deployment of tools to allow users (or their agents, such as their ISPs) to make better informed choices about internet options.

However, that policy should not discourage or penalize proprietary tools or data that is obtained using proprietary tools or data that has been processed to protect personal privacy or reasonable commercial competitive interests.

Consider, for example, if some inventor were to create a highly innovative internet measurement tool. It is the policy of our Constitution to encourage that kind of creation through the granting copyright and patent rights. Should we upturn our Constitutional policy and harm our internet by adopting internet measurement policies that would prevent us from using data from that measurement tool, even if that tool were available for all to use under an inexpensive, or even free, license?

Our goal should be to make good data available. It should not matter whether the tools to gather that data are "open source" or not. What does matter is that tools can be audited for accuracy and that they are used fairly.

What is gained by penalizing those who have chosen to create tools within the copyright and patent framework of our Constitution?

I also question any requirement that measurement data be published under a "Creative Commons 'zero'" license.

Our policy goal is to obtain and use measurement data, to assure that that data is accurate and that we understand the context in which that data was gathered.

A rule that requires that all data be conveyed into the public domain goes beyond that policy goal.

It is not necessary that data be in the public domain for it to be usable, accurate, verifiable, and in context.

Moreover the mere act of publication of data into the public domain does not by

itself improve accuracy or provide context for that data.

FCC policy should encourage fair and equal access to measurement data and should not allow anti-competitive constraints to be put onto the use of that data.

It can cost real money to gather, organize, store, and publish data. FCC policy should not forbid internet measurement data simply because someone wants to recover costs or even to make a reasonable profit.

Feedback Loops

One can foresee that products and applications will be deployed that make and utilize network measurements and modify their behavior based on those measurements.

This could cause those products or applications to become dependent upon the continued provision of those measurement services. And feedback loops could form between applications using measurements and tools that take those measurements, leading to traffic oscillations.

This is not something that I believe is of concern today. But in the longer term internet performance measurement will become integrated into applications and network management systems. As a community we should recognize that the internet is a complex distributed system and that as these mechanisms interact we may see unanticipated emergent behaviors.

Engineering the Internet So That It May Be Measured, Tested, Diagnosed, and Repaired

The internet is not well designed to be measured, tested, diagnosed or repaired.

Internet protocols and devices tend to be designed and constructed to do their primary job. Data gathering, diagnostics, and repair tend to be thought of as tertiary level concerns, if they are of concern at all.

And those measurement and diagnostic interfaces that do exist are often (and quite reasonably) put behind security barriers.

Moreover, people who do testing run the risk being of accused of being hackers or crackers who are looking for soft targets.

In the longer term we need to refit the internet with better test points, loop-back mechanisms, and diagnostic facilities. And at the same time we need to define how those may legitimately be used, and by whom.

The Brittle Internet

There is code running in the internet that is not robust or that reacts poorly as network conditions diverge from the routine.

We should anticipate that changes in network performance characteristics may not be smooth and continuous; there may be inflection points at which application behavior changes abruptly and significantly.

This may be the result of algorithms in internet protocols or it may be due to weak

or poor code in some internet elements. The latter, unfortunately, is far from rare. I often observe code falling into degraded modes – or even failing – when network conditions diverge from the routine. It is a sad truth of the internet that not all vendors adequately test their code under stressful network conditions. If we were to use aircraft as an analogy I would say that there are too many network devices out there on the internet that are like aircraft that have been tested only on sunny, calm days and have never been tested in stormy conditions.

We should thus recognize that sometimes we ought not to rely upon long extrapolations when we try to predict the effects of changes to network characteristics.

In many cases the cost of network degradation or failures will fall upon innocent users. In the fullness of time the legal regime must change so that responsibility for errors and mismanagement of the internet falls more heavily on those who build, deploy, and operate internet components than on those who use it.

Conclusion

The actual matter of this inquiry is but a very small part of a much larger whole.

The subject at hand – internet measurement – is of potentially enormous scope. The issue is not simply that of passive measurement: internet measurement will eventually be intertwined with internet control.

These are not matters that are confined to the technical realm.

Internet measurement is tied to internet management; internet management is tied to questions of resource allocation among competing uses; and resource allocation policy is tied to internet governance.

These policy issues may, and probably will, eventually come before the FCC or other governmental agencies in the US or elsewhere.

I urge the Commission to recognize that the current matter is but the first step on a very long road. Players and policymakers outside the US will seek to be involved.

As we begin we should be careful to not create policy constraints that go beyond what we actually need at this time. We should limit internet policy to what is required to reach clearly articulated goals, *and go no further.*

At this early time in these matters it is better to err on the side of less policy rather than on the side of more.

Again, thank you for letting me submit these thoughts to the Commission.